MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

December 15, 1993

TO: Gene Hall, Environmental Quality Analyst
Superfund Section
Environmental Response Division

FROM: Mike Baranoski, Geologist
Geological Services Section
Environmental Response Division

SUBJECT: Albion Sheridan Landfill, Calhoun County
Magnetometer/Gradiometer Survey

Geological Services Section (GSS) conducted a magnetometer/gradiometer survey at the Albion Sheridan Landfill in Calhoun County from October to November 1993. The survey was conducted with assistance from Superfund Section and Superfund Support Unit personnel.

The purpose of the survey was to locate ferric iron concentrations in the landfill. These concentrations may represent metal drums that are suspected to have been buried in the landfill. GSS used an Omni-Plus magnetometer system with two proton precession magnetometers, one as a field unit and another as a base station, to conduct the survey. The field unit was equipped with dual sensors allowing gradient measurements.

A magnetometer measures the earth's magnetic field intensity. Ferrous metals create local anomalies in the magnetic field intensity, allowing their detection.

A gradiometer measures the vertical gradient of the total magnetic field and inherently removes regional gradients and magnetic time variations. Gradient measurements allow better resolution of complex anomalies.

A grid was established over the landfill with north-south lines spaced every ten feet. Measurements were taken every five feet on each north-south line. The base station was positioned on the south side of the landfill in an area free of refuse and away from traffic.

During the later portion of this survey, an electronic relay malfunctioned in the base station. For periods of between 10 minutes and 2 hours, the base station was inoperative. Data was extrapolated between these periods for diurnal corrections. Readings were also taken with the field instrument at a point near the base station at least twice a day to monitor unit performance and as a reference of diurnal variation during periods when the base station was inoperative. A portion of the field data collected for line 470 was not recorded and corresponding points on lines 460 and 480 were used to contour the data.

Background and time variations were removed from the measured total field readings, the resultant data was contoured. The resultant residual values represent a combination of the fill material in the landfill plus additional magnetic material. Figure 1 illustrates residual magnetic field data. Figure 2 portrays vertical magnetic gradient. Anomalies are noted on Figure 3 and a rough draft of the landfill showing surface and cultural features is included.

Test pitting will be required to verify that the anomalies identified are due to metallic drums versus other sources of ferric iron.

If you have any questions, call me.

Mike Baranoski

Attachments

cc: B. Iversen
P. Shirey
C. Graff

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TO: Gene Hall, Environmental Quality Analyst
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FROM: Mike Baranoski, Geologist
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Environmental Response Division

SUBJECT: Albion Sheridan Landfill, Calhoun County
Comments and speculations on anomalies identified during the MDNR Magnetometer/Gradiometer survey

Per your request, I have included below some general comments and speculations in regards to the anomalies identified on the accompanying color-coded anomaly map. These anomalies are due to magnetic/metallic objects, excavation will be required to identify the source of the anomaly.

ORANGE: Areas with large metallic anomalies, trending northerly, on the eastern edge of the landfill, and in the vicinity of exposed drums. Area 2 would be the best place to start excavating, followed by Areas 4 and 1. If no barrels are uncovered in areas 2 or 4, I would suggest moving to the purple areas.

Area 1. This is a small area, with a weaker anomaly than in Area 2. If barrels are found in Area 2, Area 1 would be a good second place to check as this may represent an extension of the anomaly noted in Area 2.

Area 2. This is a small mounded area with a strong anomaly and several drums are exposed at the surface. A likely source to find drums by excavating.

Area 3. This is a large area with a weaker anomaly than the above areas. If Areas 1 and 2 yield drums, Area 3 would be a good place to check.

Area 4. This is a moderately large mounded area with a strong anomaly. This anomaly may represent more of the above trend or be a separate metallic accumulation altogether. Area 4 is worth checking.

PURPLE: These are large diffuse anomalies, located near the ends of the landfill. They may represent buried metallic items in the rubbish or possibly drums in large quantity, at greater depth. I would recommend starting with Area 1, and if drums are found, proceed to Areas 2-4-3-5-6 in succession. If no barrels are found in area 1, proceed to green area.

Area 1. This is a very large area with a large residual anomaly. Several test pits may be needed to check this due to its size.

Areas 2-6. As above, but progressively smaller in area and anomaly strength.

GREEN: Various anomalies. These are small to moderately large in area and anomaly strength. Included are point sources and a variety of metallic accumulations or items scattered throughout the refuse. Areas 1 and then 13 are recommended for test-pitting.

Area 1. This is a moderately large area with strong residual and gradient anomalies. The anomaly pattern appears to represent a large cylinder or metal-filled trench at shallow depth.

Areas 2-11. These are large to moderately large in area and anomaly intensity. They may represent metallic items associated with rubbish or areas of localized metallic accumulations.

Areas 12-13. These are of moderate size and anomaly strength, but drums and drum parts are scattered at surface in this area.

Areas 14-17. These are small in area, but with strong residual anomalies. They are point sources and may represent larger metallic items, tanks, motor parts, white goods, etc.

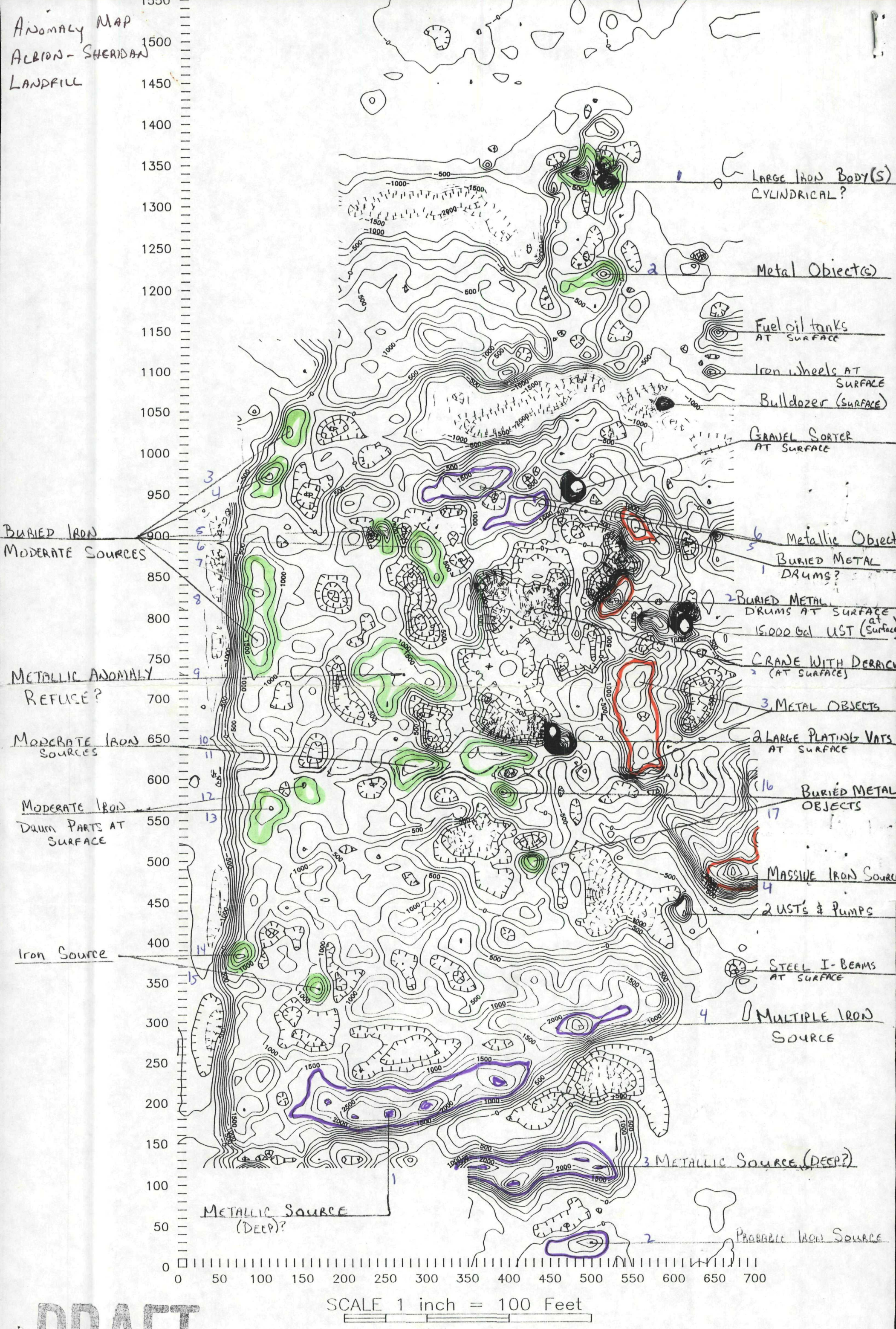
If you have any questions, call me.

Attachment

Mike Baranoski

cc: B. Iversen
P. Shirey
C. Graff

ANOMALY MAP
ALBION - SHERIDAN
LANDFILL



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INTEROFFICE COMMUNICATION

December 15, 1993

TO: Gene Hall, Environmental Quality Analyst
Superfund Section
Environmental Response Division

FROM: Mike Baranoski, Geologist
Geological Services Section
Environmental Response Division

SUBJECT: Albion Sheridan Landfill, Calhoun County
WW Engineering and Science Magnetometer/Gradiometer Survey

Per your request, I am providing some comments regarding the WW Engineering survey in comparison to a survey recently completed by MDNR Environmental Response Division personnel.

Data collected from both the MDNR and WW Engineering magnetometer/gradiometer surveys reveal similar positive and negative trends. The values indicated for both magnetometer and gradiometer surveys are comparable.

The greatest weakness noted in the survey conducted by WW Engineering was the limited extent of the survey. Only four small portions of the landfill were surveyed for magnetometer/gradiometer responses. Anomalies were identified and noted in the WW Engineering survey report. These anomalies were verified during the MDNR survey and require further investigative action.

By basing the subsequent magnetometer/gradiometer survey on the broadly spaced (50 foot line spacing) EM-31 survey, WW Engineering overlooked many anomalies. These anomalies could have been detected with a more complete survey. Additionally, no attempt was made to confirm that EM-31 survey responses in areas of the eastern portion of the landfill were actually due to surface debris, as noted in the work plan (between lines 5800N-6150N and east of station 4800E).

Some debate has occurred regarding the validity of the gradiometer data portrayed in the WW Engineering report. Because the gradiometer failed to show surface metal noted on the gradient data maps provided, it appeared that the gradiometer was malfunctioning.

Considering that the gradiometer contour interval on WW Engineering's map is 100 gammas/meter and that much of the metallic surface debris noted on the maps is small in volume, the gradiometer response was probably insignificant. The results obtained by WW Engineering's gradiometer survey are consistent with those obtained by MDNR.

If you have any questions, call me.

Michael J. Baranoski

cc: B. Iversen
P. Shirey
C. Graff